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November 4,2002

Via Electronic Filing and Hand Delivery
Ms. Marlene H. Dortch
Secretary

Federal Communications Commission
445 12th Street. S.W.
Washington, D.C. 20554

Re: ***Ex Parte*** Presentation
IB Docket No. 01-185, *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz band;*
File No. SAT-ASG-20010302-00017 et al., *Applicntion of Mobile Satellite Ventures Subsidiary LLC to Launch and Operate a Next-Generation Satellite System*

Dear Ms. Dortch:

Mobile Satellite Ventures Subsidiary LLC ("MSV") hereby files an original and four (4) copies of the attached paper entitled "Co-Channel Interference to Inmarsat-4 Using Example Spot Beam Pattern Provided by Inmarsat" for inclusion in the record of the above-captioned proceedings.

Very truly yours,

David S. Konczal

cc: Paul Locke

Co-Channel Interference to Inmarsat-4 Using Example Spot Beam Pattern Provided by Inmarsat

Prepared by:

Gary G. Churan (Director – Systems Analysis & Optimization, MSV)

November 4,2002

MSV

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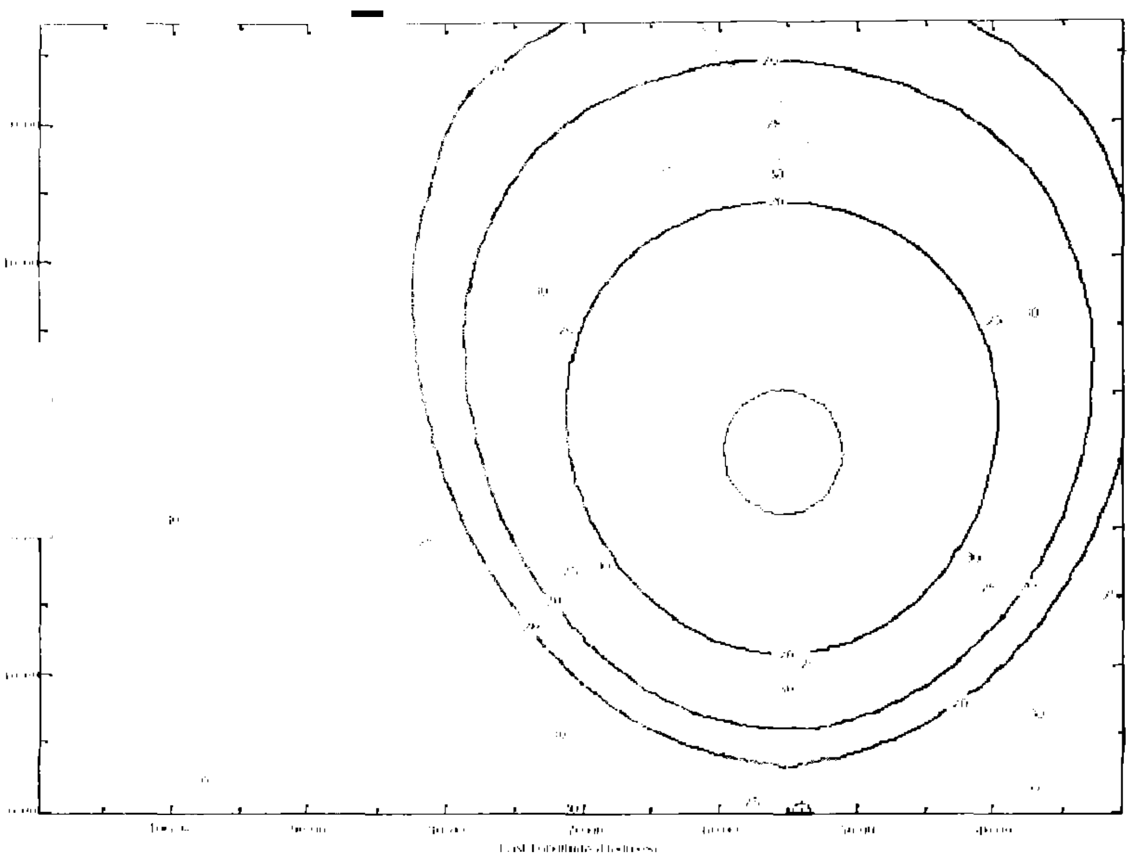
Analysis of Co-Channel Interference to Inmarsat-4 Using Example Spot Beam Pattern Provided by Inmarsat

In its most recent filing. Inmarsat continues to claim that mobile terminals operating on MSV's proposed ATC system will cause harmful interference to Inmarsat's satellite operations and prevent co-channel sharing between the satellites operated by MSV and Inmarsat. Inmarsat Ex Parte (September 9, 2002). For rhe first time, Inmarsat provides significant additional information regarding its system design and antenna patterns, sufficient for a more detailed analysis of its claims. The analysis that follows examines the impact of MSV's **ATC** operations on the case lhat Inmarsat puts forward - that of an Inmarsat-4 satellite beam that would have at least a 20 dB discrimination contour over the United States. **The** analysis confirms two key points that MSV has been making all along: (i) MSV's **ATC** operations would have no signilicant impact on Inmarsat's co-channel operations (less than a two percent increase in $\Delta T/T$) anti (ii) co-channel sharing may be problematic not due to any effect related to the **ATC** but due to satellite-only operations (there would be almost a thirty percent increase in Inmarsat's co-channel $\Delta T/T$ due to MSV's satellite-only operations),

Fig. 1: Inmarsat's Example of an Inmarsat-4 Satellite Beam
(Reproduced from Inmarsat's September 9, 2002 filing)



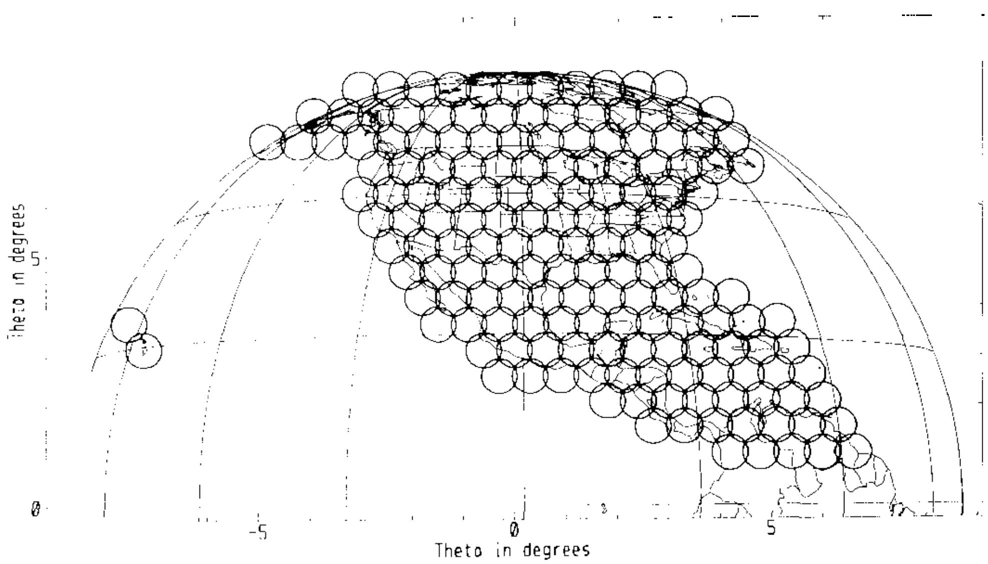
In its September 9, 2002 filing Inmarsat claimed that the satellite beam pattern of Figure 1 above is *"one of the many beams on Inmarsat-4 that Inmarsat expects will be able to share spectrum* *with MSV on a co-channel basis, and that would he adversely affected by ATC deployment*". The spot beam contour of Fig. 1 also appeared in Inmarsat's September 12, 2002 Ex-Parte presentation. There, Inmarsat included a global service area map for Inmarsat-4 at 54 ° W.L. showing the coverage areas of the Inmarsat-? spot beams. Comparing this service area map to Fig. 1. Inmarsat's example spot bcam above aligns most closely to spot beam cell location "91" on Inmarsat's service area map. However, Inmarsat in its September 12 filing clearly indicates that spot beam 91, as well as most of its neighbors, are "*I-4 beams In which MSV satellite use likely precludes co-frequency reuse.*" Needless to say that this contradicts the claim in Inmarsat's September 9, 2002 filing that this beam is one "*that Inmarsat expects will he able to share spectrum with MSV on a co-channel basis.*"

Despite Inmarsat's conflicting statements and admission that its example beam shown in Fig. 1 is in fact <u>not</u> a candidate for co-channel frequency reuse duc to expected satellite user interference, MSV has nonetheless performed a detailed interference analysis for this beam using the side lobe discrimination pattern provided by Inmarsat in Fig. 1. The analysis and numerical results are described below.

Potential Interference from MSV's Terminals Operating in Satellite Mode:

The example spot beam coverage pattcrn for MSV's next-generation satellite system has been provided in previous **MSV** filings (e.g., MSV Ex Parte Presentation, *"MSV's Next Generation Satellite System Coordination and Interference Considerations*" (January 10, 2002)) and is reproduced as Fig. 2 below:

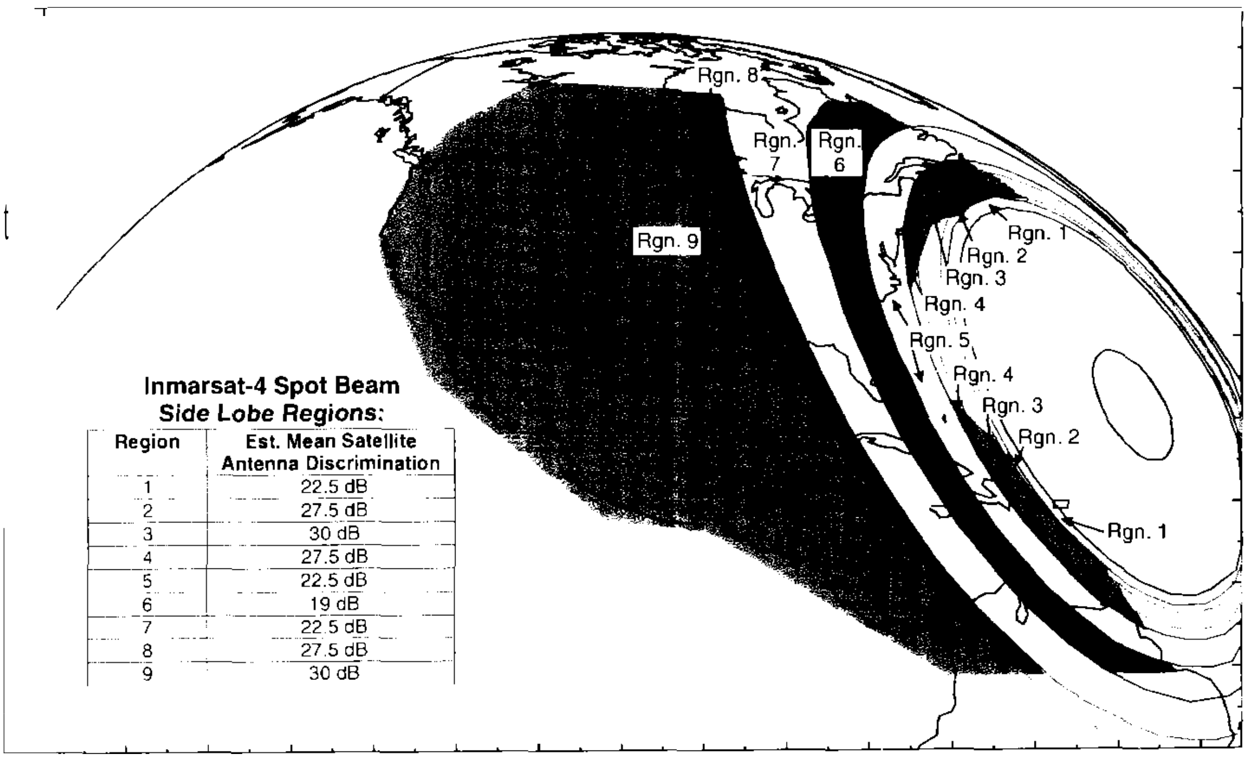
Fig. 2: MSV's Next Generation Satellite Spot Beam Pattern



The Inmarsat-4 spot beam in Fig. 1 produces concentric side lobes that overlap MSV's satellite coverage area shown in Fig. 2. To determine the precise areas of overlap, the side lobe contour lines shown in Fig. 1 wcrc digitized and then transformed from longitude-latitude scale to a satellite azimuth-elevation scale as viewed from MSV's orbital location of 101"W.L. This allows accurate projection of the Inmarsat-4 spot beam side lohe pattern onto MSV's satellire service area.

The overlay of Inmarsat's spot beam side lobe pattern forms nine distinct regions of I-4 satellire antenna discrimination over MSV's satellite service area, as shown in Fig. 3. The mean values of antenna discrimination for the nine regions, shown in the legend, wcrc estimated by taking the dB-average of their bordering contour lines from Fig.1. For Region 6, which is bordered by 20 dB contour lines on both sides, a mean discrimination value of 19 dB was assumed, because the pattern indicates that a local minimum occurs in this region.

Fig. 3: Projection of Inmarsat Spot Beam Side Lobes Onto MSV's Next-Generation Satellite Service Area



Those portions of MSV's satellite service area shown in Fig. 2 that have less than abour 5" elevation angle to Inmarsat-4 at 54" W.L. werc excluded from regions defined in Fig. 3, because users of MSV's satellite service in these areas would be unlikely to have clear line-of-sight to Inmarsat-4 due to the low elevation angles.

The areas of the nine regions in Fig. 3 were estimated graphically by calculating the solid angle (in square-degrees) within ihe perimeter defining each region. These numerical values were rhen divided by rhc coverage area of an MSV satellite spot beam to provide the expected number of MSV satellite spot beams contained within each of the nine regions. The values were then further divided by a factor of 7, which is the frequency reuse factor for the MSV satellite spot beams. This yields the expected value ofco-channel satellite carriers in each of the nine regions for a fully-loaded MSV satellite system.

In Table I, the carrier loading and antenna discrimination values for each of the nine regions are used to produce a total estimate of Inmarcat-4 received noise increase $\Delta T/T$ due to MSV's next-generation user terminals operating in satellite mode:

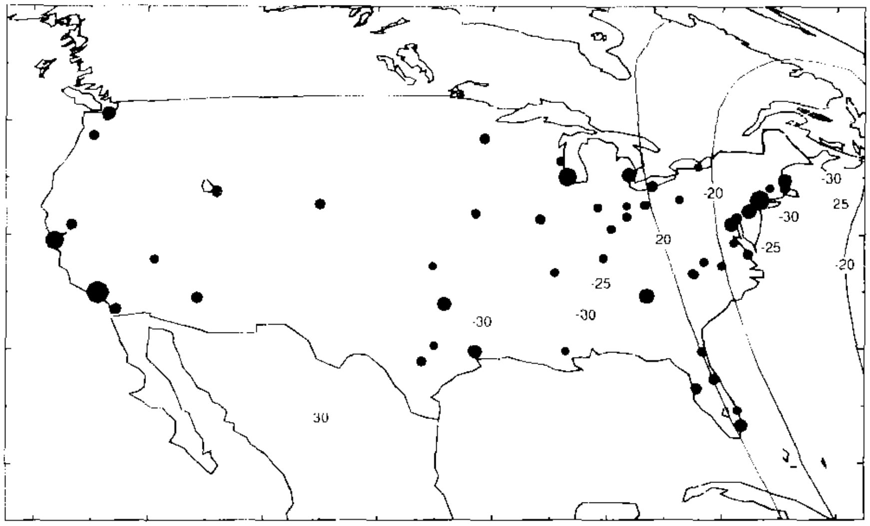
Tahle I: Potential Co-Channel Interference from MSV's Terminals to Inmarsat's Example 1-4 Satellite Spot Beam at 54" W.L.
(From satellite operations only)

		Inmarsat-4 Spot Beam Side Lobe Regions								
Parameter	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Coverage Area	sq. deg.	0.19	0.20	0.88	0.71	2.63	3.83	4.67	2.05	23.78
Spot beam spacing	degrees	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mean spot beams / region	#	0.9	0.9	4.1	3.3	12.1	17.7	21.6	9.5	109.8
Freq. reuse pattern	#	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Mean co-freq carriers / rgn.	#	**0.1**	**0.1**	**0.6**	**0.5**	**1.7**	**2.5**	**3.1**	**1.4**	**15.7**
Max MT EIRP	dBW	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MSV carrier BW	kHz	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
MT EIRP Density	dBW/Hz	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0	-42.0
Free space loss	dB	-188.8	-188.8	-188.8	-188.8	-188.8	-188.8	-188.8	-188.8	-188.8
Average shielding	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. Inm-4 antenna discrimination	**dB**	**-22.5**	**-27.5**	**-30.0**	**-27.5**	**-22.5**	**-19.0**	**-22.5**	**-27.5**	**-30.0**
Avg. MT power control	dB	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Voice activity factor	dB	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Inm-4 sat. pk. antenna gain	dB/°K	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Inm-4 rcvr. noise temp	°K	650.0	650.0	650.0	650.0	650.0	650.0	650.0	650.0	650.0
Inm-4 rcvr. noise density	dBW/Hz	-200.5	-200.5	-200.5	-200.5	-200.5	-200.5	-200.5	-200.5	-200.5
Rcvd. interference density	dBW/Hz	-226.3	-231.1	-227.1	-225.6	-214.9	-209.8	-212.4	-221.0	-212.8
Rcvd. interference density	Watts/Hz	2.4E-23	7.8E-24	1.9E-23	2.8E-23	3.2E-22	1.1E-21	5.8E-22	8.0E-23	5.2E-22
Incremental $\Delta T/T$ increase	%	0.26%	0.09%	0.22%	0.31%	3.61%	11.76%	6.41%	0.89%	5.80%
Total received interference spectral density	dBW/Hz	*-205.8*								
Total $\Delta T/T$ Increase at Maximum Reuse	%	**29.3%**								

Potential Interference from MSV's Terminals Operating in ATC Mode:

In Fig. 4. the Inmarsat-4 side lobe discrimination contour lines from Fig. 1 are projected onto a satellite view showing the geographic locations of the 50 largest U.S. cellular metropolitan service areas (MSAs):

Fig. 4: Inmarsat-4 Spot Beam Pattern Overlaying Top-50 MSAs



Previously, MSV calculated the total number of allowed ancillary co-channel carriers over CONUS to he 2,438 carriers (MSV Ex Parte Presentation, *"MSV's Next Generation Satellite System Coordination and Interference Considerations"* (January 10, 2002)). For this analysis, the 2,438 carriers are assumed to be distributed proportionally among the top-50 MSA locations in Fig. 4. This should provide a fairly realistic distribution model of MSV's **ATC** traffic within the side lobe regions of Inmarsat's example spot bcam.

Appendix A calculates the potential co-channel interference to Inmarsat's example spot beam from MSV's ATC terminals operating at locations corresponding to the 50 largest cellular MSAs. Fig. 4 was used to estimate the Inmarsat-4 antenna side lobe discrimination for each MSA location. In Table 2 below, the total received interference power calculated in Appendix A is converted to an equivalent $\Delta T/T$ increase in Inmarsat-4 satellite received noise:

Table 2: Potential Co-Channel Interference from MSV's Terminals to Inmarsat's Example 1-4 Satellite Spot Beam at 54" W.L.
(From **ATC** operations only)

Parameter	Units	Value
Inm-4 Satellite Receive Noise Temp.	K	650.0
Inm.-4 Sat. Rcv. Noise Spectral Density	dBW/Hz	*-200.5*
Inm.-4 Total Received Power from MSV Terminals Operating in ATC Mode (from Appendix A):	dBW	-165.1
MSV ATC Terminal Carrier Bandwidth	kHz	200.0
Inm-4 Received Power Spectral Density fm. MSV Terminals Operating in ATC Mode:	dBW/Hz	*-218.1*
Total ΔT/T Increase Based on Maximum ATC Frequency Reuse Across CONUS:	**%**	**1.71%**

Comparison to Previous MSV Results:

In previous filings MSV has provided calculations of potential interference levels from MSV's ATC user terminals to Inmarsat-4 assuming average Inmarsat-4 satellite antenna discrimination values of 20 dB, 25 dB, and 30 dB. In Table 3, the results of these previous calculations are compared to the ΔT/T numbers calculated above for Inmarsat's example beam pattern in Fig. 1.

Tahle 3: Potential Co-Channel Interference from MSV's Terminals in ATC Mode to Inmarsat-4 for Various Levels of Satellite Antenna Discrimination

	Inmarsat-4 Receive Antenna Discrimination Toward MSV's Satellite Service Area			
	fixed: **20 dB**	***fixed:*** **25 dB**	***fixed:*** **30 dB**	**<20 dB to 30 dB as per Fig. 1**
Potential Interference from Satellite Operations	103.6%	32.7%	10.4%	**29.3%**
Potential Interference from ATC Operations	3.37%	1.06%	0.34%	**1.71%**

Appendix A: Potential Co-Channel Interference to Inmarsat's Example Spot Beam from MSV Terminals Operating in ATC-Mode at Locations Corresponding to the 50 Largest Cellular MSAs

MSA Rank:	City	State	% of Top-50 MSA Traffic:	Proportion of MSV ATC return carriers	Elev. to Inm-4 satellite (deg.)	Max MSV terminal EIRP (dBW)	Free Space Loss (dB)	Average Shielding (dB)	Reduction fm. Closed-Loop Power Control (dB)	Variable-Rate Vocoder (dB)	Avg. Cross-pol. Isolation (dB)	Voice Activity Factor (dB)	Inm-4 Spot Beam Ant. Gain (dBi)	Est. Inm-4 Receive Antenna Discrim. (dB)	Inm-4 satellite rcvd. signal pwr. per ATC carrier (dBW)	Inm-4 rcvd. signal pwr. fm. all MSV ATC carriers (W)
1	LosAngeles	CA	8.1%	196	12.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	5.92E-19
2	NewYork	NY	6.0%	145	38.6	0	-188.8	-10	-6	-7.4	-3	-1	41	-24	-199.2	1.74E-18
3	SanFrancisco	CA	5.3%	129	8.4	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	3.90E-19
4	Chicago	IL	5.2%	126	30.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-24	-199.2	1.51E-18
5	Atlanta	GA	3.6%	88	39.1	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	1.68E-18
6	Philidelphia	PA	3.2%	78	38.9	0	-188.8	-10	-6	-7.4	-3	-1	41	-23	-198.2	1.18E-18
7	Washington	DC	3.0%	74	39.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-21	-196.2	1.78E-18
8	Dallas	TX	3.0%	74	30.4	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	2.23E-19
9	Detroit	MI	3.0%	74	32.9	0	-188.8	-10	-6	-7.4	-3	-1	41	-21	-196.2	1.78E-18
10	Boston	MA	2.9%	71	38.1	0	-188.8	-10	-6	-7.4	-3	-1	41	-28	-203.2	3.40E-19
11	Houston	TX	2.8%	69	33.3	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	2.08E-19
12	Miami	FL	2.8%	68	48.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	2.05E-18
13	Seattle	WA	2.6%	64	5.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.93E-19
14	Tampa	FL	1.9%	47	44.7	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	8.96E-19
15	Phoenix	AZ	1.9%	46	18.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.39E-19
16	Sacramento	CA	1.8%	45	8.7	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.36E-19
17	Minneapolis	MN	1.8%	43	25.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.30E-19
18	SanDiego	CA	1.8%	43	14.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.30E-19
19	Cleveland	OH	1.7%	43	34.4	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	1.30E-18
20	SaltLakeCity	UT	1.7%	41	15.3	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.24E-19
21	Orlando	FL	1.6%	39	45.2	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	1.18E-18
22	StLouis	MO	1.6%	39	31.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.18E-19
23	Denver	CO	1.6%	39	20.9	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.18E-19
24	Charlotte	NC	1.6%	39	40.1	0	-188.8	-10	-6	-7.4	-3	-1	41	-19	-194.2	1.48E-18
25	Baltimore	MD	1.5%	37	38.9	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	7.05E-19
26	Norfolk	VA	1.5%	37	41.2	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	7.05E-19
27	Portland	OR	1.4%	35	6.2	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.06E-19
28	SanAntonio	TX	1.4%	34	31.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	1.03E-19
29	KansasCity	MO	1.3%	32	28.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	9.66E-20
30	Columbus	OH	1.2%	30	35.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	9.06E-19
31	Cincinnati	OH	1.2%	30	34.9	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	5.72E-19
32	Nashville	TN	1.2%	30	35.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-24	-199.2	3.61E-19
33	Milwaukee	WI	1.2%	29	29.7	0	-188.8	-10	-6	-7.4	-3	-1	41	-24	-199.2	3.49E-19
34	Providence	RI	1.1%	28	38.6	0	-188.8	-10	-6	-7.4	-3	-1	41	-28	-203.2	1.34E-19
35	Jacksonville	FL	1.1%	27	43.6	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	8.15E-19
36	LasVegas	NV	1.1%	27	14.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	8.15E-20
37	Memphis	TN	1.1%	27	34.3	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	8.15E-20
38	WPalmBeach	FL	1.1%	26	47.5	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	7.85E-19
39	Raleigh	NC	1.1%	26	40.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	7.85E-19
40	Austin	TX	1.1%	26	31.2	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	7.85E-20
41	Louisville	KY	1.0%	26	34.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-23	-198.2	3.94E-19
42	Greensboro	NC	1.0%	25	40.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-19	-194.2	9.50E-19
43	Indianapolis	IN	1.0%	25	33.3	0	-188.8	-10	-6	-7.4	-3	-1	41	-23	-198.2	3.78E-19
44	Pittsburgh	PA	1.0%	25	36.0	0	-188.8	-10	-6	-7.4	-3	-1	41	-19	-194.2	9.50E-19
45	OklahomaCity	OK	1.0%	24	28.6	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	7.25E-20
46	Hartford	CT	1.0%	23	38.2	0	-188.8	-10	-6	-7.4	-3	-1	41	-25	-200.2	2.20E-19
47	Richmond	VA	0.9%	23	40.1	0	-188.8	-10	-6	-7.4	-3	-1	41	-21	-196.2	5.52E-19
48	Rochester	NY	0.9%	22	34.8	0	-188.8	-10	-6	-7.4	-3	-1	41	-20	-195.2	6.64E-19
49	Dayton	OH	0.9%	22	34.4	0	-188.8	-10	-6	-7.4	-3	-1	41	-22	-197.2	4.19E-19
50	NewOrleans	LA	0.9%	22	37.6	0	-188.8	-10	-6	-7.4	-3	-1	41	-30	-205.2	6.64E-20
															Total Inmarsat-4 Received Signal Power Per Co-frequency Channel From MSV's ATC Return Carriers (dBW):	**-165.1**

Technical Certification

I, Gary G. Churan, Director – Systems Analysis & Optimization of Mobile Satellite Ventures L.P., certify under penalty of perjury that:

I am the technically qualified person with overall responsibility for the preparation of the technical information contained in the above paper entitled "Co-Channel Interference to Inmarsat-4 Using Example Spot Beam Pattern Provided by Inmarsat" and the information contained in this document is true and correct to the best of my belief.

Gary G Churan

Gary G. Churan

Dated: November 4,2002